

- Can agencies use the new HSM to identify and analyze horizontal curves in need of safety improvements?
- If an HSM analysis is possible, how much effort should the agency expect to make?
- What steps should agencies take to make the HSM analysis more efficient to utilize and more cost-effective?

In satisfying these objectives for this paper, we hope to shorten the learning curve for agencies in using the HSM. We also hope to reduce the risk agencies and professionals will assume if they use this new tool. The results from this paper should also help agencies budget appropriately when employing the HSM.

The scope of the paper is limited in two important ways. First, the paper covers only the application of the HSM to two-lane rural horizontal curves (a portion of Chapter 10). Similar results might be expected when applying the HSM to other highway settings, but we would not know that for sure. We hope that others will undertake similar efforts and provide guidance on applying the HSM to other situations (e.g. multi-lane highways). Second, the paper only uses data from North Carolina. North Carolina is a large state with diverse terrain, climates, and driver demographics and should be representative of much of the US, but states with large differences in highway system design and operation, collision reporting, and other important factors should apply the recommendations in this paper cautiously and/or conduct their own calibration efforts

#### 6.1.1 Horizontal Curve Crash Data

The crash data analysis in this study was focused on NC roads. NC experiences a broad range of topographic conditions, climates, and rural/urban settings. This diversity in conditions makes NC an appealing location for determining representative horizontal curve collision characteristics. The reporting threshold in NC is a collision that resulted in a fatality, non-fatal personal injury, property damage of \$1,000 or more, or property damage of any amount to a vehicle seized. The NCDOT controls almost 80,000 miles of roadways, which creates consistency across the state with roadway design, construction, and maintenance. These factors make findings based on NC collision data useful to many other jurisdictions.

Horizontal curves are an important consideration because 21% of all 2-lane collisions occur on horizontal curves and collisions on two-lane curves are more than twice as likely to result in a fatality as all two-lane roadway segments in North Carolina (Hummer 2010).

## 6.2 Literature Review

Due to the recent release of the HSM, few studies have been completed on calibrating the crash prediction models in the HSM. However, two studies were reviewed that did evaluate the application of the HSM. The first study, by Sun et al. (Sun 2006), evaluated the applicability of the HSM safety prediction model to states from which crash data was not used in the original model development. The prediction model evaluated in this study was the method for 2-lane rural roads in the draft HSM. Data from state routes in